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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,180	08/29/2001	John T. Moore	MI22-1776	8591

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EXAMINER


ROCCEGLANI, RENZO

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 08/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/943,180	Applicant(s) MOORE ET AL. 	
	Examiner Renzo N. Rocchegiani	Art Unit 2825	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 June 2004.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 and 40-61 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-20 and 40-61 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>02/18/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-20 and 40-61 are rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 5,731,235 (Srinivasan et al.) in view of European Patent No. 886308 A2 (Kobayashi et al.).

Srinivasan et al. discloses a process to form a capacitor wherein a first electrode (item 42, Fig. 9), of a silicon comprising material (col. 4, lines 5-15), is formed over a substrate (item 32, Fig. 9), wherein a dielectric region (items 62, 46, 47, 52 and 60, Fig. 9) is formed over the first electrode and wherein a second electrode (item 54, Fig. 9) is formed over the dielectric region. The dielectric region comprises a first oxide layer (item 62, Fig. 9) over the first electrode, a silicon nitride layer (item 46, Fig. 9) over the oxide layer, wherein the nitride layer comprises pin holes (item 47, Fig. 9), a silicon comprising layer (item 50, Fig. 6, see also item 20, Fig. 3 and col. 3, lines 37-47) is deposited over the silicon nitride, the silicon comprising layer is then nitridized to form a second silicon nitride layer (item 52, Fig. 9) without affecting the silicon comprising material inside the pin holes, finally an additional silicon oxide layer (item 60, Fig. 9) is deposited over the nitridized silicon comprising layer. Srinivasan et al. also disclose depositing the first silicon nitride layer at a temperature of

400 degree C or above (col. 3, lines 18-24).

Srinivasan et al. do not specify the use of a silicon dioxide for the silicon comprising layer and do not disclose the use of a plasma for the nitridation process. Srinivasan et al. further do not specify the spacing between the substrate and the electrode in the plasma chamber. Yet, Srinivasan et al disclose that other materials known in the art may be applied for their invention (see col. 4, lines 48-55). Furthermore Srinivasan et al. discloses that silicon dioxide is not only a well known and typically preferred material in the formation of capacitor dielectric layers (see col. 1, lines 20-31) but it also is a good material to cure the pin holes in silicon nitride which is the problem they are addressing. (see col. 1, lines 43-49). Formation of silicon dioxide implies an oxidation step.

Kobayashi et al. teach the nitridation of silicon dioxide using a plasma. (See abstract).

It would have been obvious to one having ordinary skill in the specific art to combine the teachings of Srinivasan et al. to those of Kobayashi et al., and thus arrive at the claimed invention, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 SUPQ 416. Furthermore, it would have been obvious to use plasma nitridation since as taught by Kobayashi et al., using a plasma will resolve a number of problems encountered in high thermal nitridation and since plasma nitridation of silicon dioxide will result in a modified oxide layer, i.e. the formation of silicon nitride. (See Kobayashi et al., col. 2 and col. 8). Finally, because it

is well known in the specific art that the spacing between the plasma electrode and the substrate would affect the manipulation of the other variable such as power and pressure during the plasma process, such spacing is a result effective variable and thus discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Response to Arguments

3. Applicant's arguments filed on June 3, 2004 have been fully considered but they are not persuasive. Applicant argues that the pending claims are not obvious over the prior art because applicant alleges that the prior art does not render obvious the formation of an oxide layer over the nitride that also fills the pin holes. The examiner disagrees. As presented in the previous office actions, Srinivasan et al. teach the formation of layer 50, a silicon layer, over the nitride layer 46 that has pin holes 47. Layer 50 is formed on layer 46 and fills in the pin holes 47. Srinivasan et al. does not specify what type of material layer 50 is, instead Srinivasan et al. states that layer 50 is a silicon layer. Yet, Srinivasan et al. also discloses that silicon oxide is a material that is well known in the art in its use as a filler for pin holes in silicon nitride. Thus, Srinivasan et al. renders this limitation obvious. Layer 50 is further nitridized also as required by the claim language. Thus, this limitation is rendered obvious.

Applicant focuses on the statement made by the examiner in the previous office action, i.e. that the language of the claims does not include the limitation regarding the oxidation to fill the pin holes. The examiner would like to clarify that applicant has mischaracterized the examiner's statements. Referring to the previous office action,

page 4, under the "Response to Arguments" section, half way down in the paragraph the examiner stated that "The limitation the applicant refers to, i.e. that the "oxidation after forming nitride comprising layer 20 can effectively fill pin holes within layer 20 with silicon oxide derived from the underlying first capacitor electrode material", is nowhere in the claim language." In this statement the examiner quoted applicant's assertion found on page 14 of the response filed in January of 2004. The quoted sentence includes the limitation of "derived from the underlying first capacitor electrode material". This wording is what is not found in any of the claims. The examiner never stated that the formation of silicon oxide over the nitride layer to fill the pin hole is not present in the claim language and such limitation has always been addressed.

For the above reasons, applicant's arguments are not deemed to be persuasive and the rejection stands.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renzo N. Rocchegiani whose telephone number is (571)272-1904. The examiner can normally be reached on Mon.-Fri. 8:00 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571)272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Renzo N. Rocchegiani
Examiner
Art Unit 2825

A handwritten signature in black ink, appearing to read 'Matthew Smith', with a stylized, cursive script.

MATTHEW SMITH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800